
Five New Species of *Guarea* (Meliaceae), Two from the *Guarea glabra* Vahl Complex, in Central America

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ABSTRACT. Morphometric analysis of the *Guarea glabra* Vahl complex (Meliaceae) from Central America has distinguished 12 species, and two of these species are new to the complex: *G. arcuata* Coronado and *G. petenensis* Coronado. In addition, three species discovered to be superficially similar to the members of the *G. glabra* complex are found to be undescribed: *G. gentryi* Coronado, *G. mexicana* Coronado, and *G. zarceroensis* Coronado. The five new species are described below.

Key words: Central America, *Guarea*, *Guarea glabra* complex, Meliaceae.

Guarea L. is a distinctive Neotropical member of Meliaceae with continuously growing leaves. Pennington et al. (1981), the most recent monographers of the genus, recognized 35 species widely distributed in Central and South America. According to Pennington et al. (1981), *G. glabra* Vahl is one of the most variable of these species. Early workers, both flora writers (Blake, 1920) and monographers (Candolle, 1878), recognized several species in this complex, although these authors had very little material with which to work. Standley and Steyermark (1946) recognized six species in the *G. glabra* complex from Guatemala, while Smith (1965) listed two species from the complex in Panama. Pennington et al. (1981) recognized six poorly distinguishable races within the complex, and later Pennington and Styles (2001) took a similarly broad view in Nicaragua.

Guarea glabra is difficult to characterize because it is so variable, but it has a 4(5)-carpellate gynoeceum with one ovule per loculus and a small (< 3.5 cm diam.) fruit. Its twigs and fruits usually lack lenticels, and there are quite often trichome tufts (domatia) on the lower surface of the leaflets. Coronado (2003) conducted a morphometric analysis of the *G. glabra* complex focusing on the Central America taxa. Variation was analyzed using principal components analysis (PCA) and unweighted pair group method with arithmetic mean (UPGMA) with a variety of combinations of characters and carried out at a variety of geographic scales. Twelve morphologically distinct

entities (i.e., discrete clusters of specimens consistently appearing in country-level and lower-level analyses of variation) were evident, and these were recognized as species. The most important characters that differentiate species in the *G. glabra* complex are leaflet length, color upon desiccation, nature of the apex, number and course of secondary veins, petiolule length, pedicel width, petal length, staminal tube length and width, anther length and width, and ovary pubescence. Fruit characters are also useful, although relatively little material has ripe fruit (see Coronado, 2003). Two of the 12 recognized species, *G. arcuata* Coronado and *G. petenensis* Coronado, in the *G. glabra* complex are described below. Several collections from Central America previously identified as members of the *G. glabra* complex (Coronado, 2003) are recognized and described below as species of *Guarea*: *G. gentryi* Coronado, *G. mexicana* Coronado, and *G. zarceroensis* Coronado.

1. *Guarea arcuata* Coronado, sp. nov. TYPE: Costa Rica. Cartago, *Brown 17521* (holotype, F).

A speciebus aliis *Guareae*, praesertim *G. glabra* s.l., in foliis in siccitate glabris brunneis haud discoloris venis lateralibus prominentibus arcuatis marginibus haud attingentibus, pedicellis ca. 3.5 mm longis, et floribus fructibusque glabris, differt.

Tree 5–30 m tall, 10–15 cm diam.; young branches glabrescent. *Leaves* with 2 to 4 pairs of leaflets, rachis semi-terete, finely pubescent; *petiolule* canaliculate, glabrescent, 5–13 × 2.5–3.5 mm; *blade* subcoriaceous, ovate, elliptic-oblong, 10–17.5 × 4–6.5 cm, apex short-acuminate, acumen 0.7–1.2 cm, base short-attenuate, both surfaces drying brown, adaxial surface glabrous, abaxial surface with hairs in vein axils, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins prominent, strongly arcuate, not reaching the margin, 6 to 9 pairs, 1.5–4 cm apart, tertiary veins raised. *Inflorescence* a raceme (branched), axillary or cauliflorous, 5–8 cm, glabrous; bracts 0.5–1 mm, sparsely pubescent; *pedicel* ca. 3.5 × 1 mm. *Flowers* white, glabrous,

apex of bud acute; calyx \pm spreading, lobes 4 or 5; petals strap-shaped, apex acute; staminal tube glabrous, margin toothed; ovary surface irregular, glabrous, 4- to 5-locular, locules 1-ovulate. *Staminate flower*: calyx 1.5–2 mm, lobes ca. 0.5 mm; petals 7–8.5 \times 1.5–2 mm; staminal tube 5–6 \times ca. 3 mm; anthers ca. 1 \times 0.3 mm; gynophore ca. 1.5 \times 2 mm; nectary ca. 1 \times 1 mm; ovary ca. 2 mm; style ca. 2.5 mm; stigma ca. 0.3 \times 1 mm. *Carpellate flower*: calyx 2–2.5 mm, lobes ca. 1 mm; petals 6–6.5 \times ca. 2.5 mm; staminal tube 5–6 \times ca. 3.5 mm; anthers ca. 0.8 \times 0.5 mm; gynophore 0–1 \times ca. 1 mm; nectary 0–0.5 \times ca. 1 mm; ovary ca. 3 mm; style ca. 2 mm; stigma ca. 0.3 \times 1 mm. *Fruit* globose, red, ca. 2.5 cm diam., glabrous, surface smooth or with small lenticels; seeds 4; aril red.

Ecology, distribution, and phenology. In cloud, rain, and remnant oak forest, 1550–2450 m. Costa Rica (Cartago) and Panama (Chiriquí). Flowering and fruiting from January to October.

Guarea arcuata has very distinctive venation and flowers, the former in particular distinguishing it from other species of the *G. glabra* complex. The secondary veins are very prominent and arch broadly toward the leaflet margin, although they do not reach it, the fine venation is also raised, and the petiolule is 5–13 mm long; the flowers are glabrous.

Paratypes. COSTA RICA. **Cartago:** Turrialba, Tayutic, Fila Vereh, alto entre cuenca del Río Vereh y El Jicotea, A. Cascante M. 604 (K); near Camp Empalme, Pan Amer. Hwy., E. L. Little 6024 (F, MO). PANAMA. **Chiriquí:** Boquete, vic. Boquete, Finca Collins, W. L. Stern, K. L. Chambers, J. D. Dwyer & J. E. Ebinger 1090 (F, MO); 6 mi. E of Cerro Punta on Boquete Trail, E. L. Tyson 7213 (MO); vic. Bajo Mona & Quebrada Chiquero, R. E. Woodson & R. W. Schery 587 (MO); Renacimiento, Jurutungo–Piedra Candela, C. Galdames, J. Aranda, J. Guillén & B. Araúz 3480 (MO); Jurutungo, alrededores de la finca Los Quetzales, C. Galdames 3381 (MO).

2. *Guarea petenensis* Coronado, sp. nov. TYPE: Guatemala. Petén: Río Pasión, Río Pucte tributary below Sayaxche, betw. Pucte & La Libertad, 5 Mar. 1964, C. L. Lundell 18164 (holotype, MO).

A speciebus aliis *Guareae*, praesertim *G. glabra* s.l., in foliis in siccitate viridis venis secundariis plus minusve planis et pilis in axillis venarum instructis, calyce circa 1 mm longo (in floribus carpellatis) et ovariis pilis sparsis praeditis, differt.

Tree or treelet 5–20 m tall, 30 cm diam.; young branches strigillose or glabrescent, light brown or reddish brown. *Leaves* with 2 to 4(to 6) pairs of leaflets, rachis terete, strigillose; *petiolule* terete, strigose, 2–9 \times 1–5 mm; *blade* subcoriaceous,

elliptic-ovate to elliptic, 5.5–18.5(–22) \times 2.6–6.3 (–8) cm, apex acuminate (acute), acumen 0.7–1.5(–2) cm, base short-attenuate, both surfaces drying pale green, adaxial surface glabrous, abaxial surface sparsely pubescent in vein axils and at margin, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins \pm flat, slightly curved, not reaching the margin, 7 to 12 pairs, 1–3 cm apart, tertiaries raised, reticulate, not bullate. *Inflorescence* axillary or ramiflorous, a panicle, 2.5–4.5(–7.5) cm, sparsely strigillose, branches to 5 mm, 0 to 2 per inflorescence; bracts ca. 1 mm, densely pubescent; pedicel 0.5–2 \times 0.3–1 mm, pubescent. *Flowers* cream or white, apex of bud rounded, sparsely pubescent mainly on the calyx and petal apices; calyx \pm erect, teeth 4; petals strap-shaped, glabrous, apex acute; staminal tube sparsely pubescent outside, glabrous inside, margin toothed or entire; ovary surface smooth, pubescent, 4-locular, locules 1-ovulate. *Staminate flower*: calyx ca. 0.5 mm, teeth 0.2–0.4 mm; petals 5–6.5 \times 2–2.5 mm; staminal tube ca. 5.5 \times 2 mm; anthers ca. 1 \times 0.3 mm; gynophore ca. 1 \times 1 mm; nectary ca. 0.5 \times 1.5 mm; ovary 1–1.5 mm; style ca. 3 mm; stigma 0.2–0.3 \times 0.5–0.8 mm. *Carpellate flower*: calyx ca. 1 mm, teeth 0.2–0.4 mm; petals 3.5–4.5 \times 1–2 mm; staminal tube ca. 3–5 \times 3–3.5 mm; anthers ca. 1 \times 0.5 mm; gynophore 0–0.5 \times 0–1 mm; nectary absent; ovary 1–1.5 mm, sparsely pubescent; style ca. 2 mm; stigma 0.2–0.3 \times 0.5–0.8 mm. *Fruit* globose, red, ca. 2 cm diam., surface rough, glabrous, sometimes sparsely pubescent, without a stipe; seeds 4; aril white.

Ecology, distribution, and phenology. Mature and very disturbed remnants of semideciduous forests, 150–1000 m. Mexico (Campeche, Chiapas, Jalisco, Nayarit, Oaxaca, Puebla, Quinta Roo, Tabasco, and Veracruz), Belize (Cayo, Orange Walk, and Toledo), Guatemala (Alta Verapaz, Izabal, and Petén), and Honduras (Atlántida and Olancho). Flowering and fruiting throughout the year.

Guarea petenensis is particularly common in Ocosingo, Mexico, and Alta Verapaz and Petén in Guatemala. It can be distinguished from the other species of the *G. glabra* complex by its sparsely pubescent leaflets that are elliptic-ovate to elliptic in shape, with trichome tufts in the vein axils, and by its short calyx ca. 1 mm (carpellate flowers) and sparsely pubescent ovary.

Paratypes. MEXICO. **Campeche:** Hopelchén, 4 km O del Ejido Santa Rosa, P. Alvaro M. 615 (MEXU). **Chiapas:** Ocosingo, en las orillas del lado N de la Colonia Benito Juárez Miramar, sobre el camino a Laguna Miramar, A. Reyes & M. Sousa S. 2192 (MO); Ocosingo, zona arqueológica de Yaxchilan, Rincón 911 (MEXU); Ocosingo, 8 km al NW de

Boca Lacantúm camino a Palenque, *E. Martínez S.* 11796 (MEXU, MO); Ocosingo, zona Marqués de Comillas, 3 km al SE de Ejido Benemerito de las Américas, camino a Flor de Cacao, *E. Martínez S.* 7168 (MEXU, MO); Ocosingo, 3 km de Frontera Corozal sobre el Río Usumacinta, *E. Martínez S.* 11450 (F, GH, MEXU, MO); Ocosingo, 9 km al NW de Crucero Corozal, camino San Javier–Lacanjá Chanzayab, *E. Martínez S.* 6983 (MO); Ocosingo, Estación Chajul, sobre el Río Lacantún, *E. Martínez S., C. H. Ramos, G. Domínguez & R. Lombera* 26463 (MEXU); Ocosingo, 500 m SE del poblado de Lacanjá Chanzayab, *López-García* 117 (MEXU); Sabanilla, Finca Carmen, *A. Méndez T.* 6345 (F, MEXU, MO). **Jalisco:** La Huerta, Rancho Cuixmala, Gargollo farm, E side of Cerro de la Alborada, *E. J. Lott, A. C. Sanders & P. A. Fryxell* 4107 (MO). **Nayarit:** Islas Mariás, María Madre, *Maltby* 43 (NY). **Oaxaca:** 5 km al N de El Cantil, camino a Sola de Vega, *R. Cedillo T. & R. Torres C.* 1802 (MO); Juchitán, 13 km al SW de Santa María Chimalapa, *R. Cedillo T. & R. Torres C.* 1157 (MO); Matías Romero, 22 km al S de Esmeralda, 9 km al S del aserradero La Floresta, lomas al S de Río Verde, *T. Wendt, A. Villalobos C., I. Navarrete & J. Anguiano* 3082 (MO); Pochutla, San Miguel del Puerto, Xadani, 1.5 km W hacia San Miguel, *J. Rivera H., S. Salas M. & M. Elorsa C.* 2156 (MO); Santa María Chimalapa, cresta del cerro al N del Río del Corte, ca. 8 km NE de Santa María, *H. Hernández G.* 959 (MO); Santa María Chimalapa, Río Verde, 7 km en línea recta al NE de Santa María Chimalapa, *P. Vera C., T. Wendt, H. Hernández G. & V. Gonzalez* 155 (MO). **Puebla:** Rancho El Ajengibre, *T. D. Pennington & J. Sarukhan* 9294 (CAS, NY). **Quintana Roo:** Km 77 de la carr. Ucum–La Unión, *E. Cabrera, J. L. Godínéz & H. de Cabrera* 4540 (MO); 20 km al N de La Unión, *E. Cabrera & H. de Cabrera* 2129 (MO); Othón P. Blanco, ruinas arqueológicas de Kohunlich, *R. Duran, R. Simá & C. Espadas* 2746 (MEXU). **Tabasco:** Balancán, *E. Matuda* 3085 (F, NY); Balancán, La Palma, *E. Matuda* 3269 (F, NY); Rancho Dos Montes, Km 12, Carr. Villahermosa–Escaregea, atras del aeropuerto de Villahermosa, *Ascencio* 100 (MEXU); Tenosique, ca. 15 km arriba de La Palma, por río a 5 km del Rancho Punta de Montaña, *R. Cowan & R. Niño* 3370 (MO). **Veraacruz:** Hidalgotitlán, Agustín Melgar, *Brigada Vazquez* 505 (K, MO); Colonia Melchor Ocampo, Cantón de Córdoba, *C. Conzatti* 171 (GH); Catemaco, *A. Villegas H.* 1 (F, K); Cerro del Vigía, Catemaco, *J. I. Calzada* 850 (F, K). **BELIZE.** **Cayo:** Hummingbird Hwy., 5.7 mi. S of Western Hwy., *D. E. Atha & J. Walker* 1154 (MO, NY); betw. Millionario & Cuevas, *J. D. Dwyer* 10822 (MO); 24.7 km al O de San Ignacio, sobre el camino a Belmopan, *E. Cabrera, P. Cowan & R. Durán* 7749 (MEXU, MO); Chaa Creek, bank of Río Macal, *J. L. Brown & P. Cocon* 38 (MO); Mtn. Pine Ridge Forest Res., Río Frio Caves, 1 km W of Augustine, *J. Meave & A. Howe* 1439 (MO); Mollejon Creek, on Morris Rd., 5 km S of Augustine, *J. Meave & A. Howe* 1414 (MO); vic. Millionario, *A. Gentry* 7703 (MO, NY); Cohune Ridge, *C. L. Lundell* 6484 (F, NY); Benque Viejo, bordering Río Mopan, *E. Contreras* 7078 (MO, NY); Chiquibul Forest Res., San Pastor track, 1 km from Las Cuevas, *A. Ibáñez G.* 69 (MO), *A. K. Monro* 1434 (MO); El Pilar 13 km NW of San Ignacio, near Bullet Tree Village, *R. Arvigo* 821 (GH, MO); Vaca Plateau, Blue Hole Camp, *D. A. Sutton et al.* 18 (MO); 8 mi. S of Cohune Ridge, near Spanish water hole, *M. J. Balick et al.* 2059 (K); Valentin, *C. L. Lundell* 6351 (NY); Xunantunich, *D. Lentz et al.* 2715 (NY). **Orange Walk:** Indian Church, *T. Arnason & J. Lambert* 17033, 17090 (MO); Río Bravo Conserv. & Managem. Area, *N. V. L. Brokaw* 314 (MO). **Toledo:** vic. Sapote Camp, ca. 6.5 mi. due W of Medina Bank, *G. R. Proctor* 35999 (MO); Sand Hill, Punta Gorda, *W. Schipp* 1001 (F, MO, NY).

GUATEMALA. **Alta Verapaz:** vic. caves, SW of Lanquín, *J. A. Steyermark* 44124 (F, NY); Semococh, on Cobán Rd. from Sebol, *E. Contreras* 4687 (GH); Telemán, Finca Mercedes, Panzós, faldas de la Sierra de las Minas, Quebrada Mercedes, *E. Martínez S., P. Tenorio, H. Droege & M. Díaz* 22748 (MO). **Izabal:** 10–15 km W of El Estor, *W. E. Harmon & J. D. Dwyer* 4307 (MO); Río Dulce, betw. Livingston & 6 mi. up river, *J. A. Steyermark* 39385 (F). **Petén:** 35 km E de Sta. Elena, brecha El Remate–Tikal, *A. Molina R.* 15410 (F, NY); vic. shoreline of Lake Yaxha, *B. D. Vanderveen* 671 (MO); Río Pasión, on Ceibál ruins, *C. L. Lundell* 17646 (GH); Carmelita, *F. E. Egler* 42-318 (F); ca. 5 mi. S of Tikal Natl. Park, *J. D. Dwyer* 11260 (NY, MO); Tikal Natl. Park, vic. Temple 4, *M. Schulze* 5, 59 (MO); citio arqueológico, en el camino al campamento chicleiro Mushanal, a 2 km, lado S de la Aldea Uaxactun, *R. Tún O.* 2562 (F, MO, NY); Dos Lagunas, Ixcario, on Melchor de Menco Rd., 12 km SE, *E. Contreras* 8614 (MO); El Cedro, *E. Contreras* 8452 (MO); El Naranjo, *C. L. Lundell & E. Contreras* 20573 (F, MO, NY); El Paso, *C. L. Lundell* 1459 (F); Guayacán, ca. 6 km N on El Ceibo Rd., *E. Contreras* 7350 (MO, NY); Guayacán, 2 km N of Laguna Guayacán, *E. Contreras* 7391 (MO); La Cumbre, Las Cañas, E of Km 142, Petén–Izabál rd., *C. L. Lundell & E. Contreras* 19064 (MO); La Cumbre, bordering Río Pusila, ca. 6 km from village, *E. Contreras* 6948 (MO, NY); La Libertad & vic., *M. Aguilar H.* 255 (F, MO); Lacandón, ca. 3 km SW on El Caribál trail, *E. Contreras* 3405 (MO); Macanché, bordering lake, *C. L. Lundell & E. Contreras* 19236 (MO); Puerto Chimono, Laguna Petexbatún, 20 km S of Sayaxché, *H. Zomer* 288 (F); Santa Elena, on Sementario Santa Elena, *E. Contreras* 5745 (MO); 5 mi. S of Tikal, *A. Gentry* 8362 (MO, NY); Uaxactun, Bajo El Corchál, *C. L. Lundell & E. Contreras* 19980 (MO); bordering Lake Petén Itzá, betw. San José & Chachaclún, *E. Contreras* 10349 (MO, NY); Milpa Grande at Macanché, *E. Contreras* 5456 (F); Chinchilá, Seból Rd., *E. Contreras* 10687 (F); Westufer des Lago Petén Itzá, 1 km NNE-NE, Zentrum von San José, *B. Wallnöfer & F. M. Tut-Tesucun* 5963 (MO). **HONDURAS.** **Atlántida:** Coyoles, *A. Molina R. & Becker* 20 (F). **Comayagua:** Río Hondo, 5 km de La Libertad, *A. Molina R. & A. R. Molina* 26848 (F); N of La Libertad, *D. Hazlett* 1688 (MO); Valle de Jamalteca, *A. Molina R.* 7184 (F); Villa de Taulabé, Quebrada de Caliche, *C. Nelson, E. Vargas, C. Alduvín & M. Pereira* 3538 (MO). **Olancho:** Valle de Catacamas, Santa María del Real, *A. Molina R.* 8423 (F, MO).

3. *Guarea gentryi* Coronado, sp. nov. TYPE: Costa Rica. Heredia, Finca La Selva, OTS Field Station on Río Puerto Viejo just E of jct. with Río Sarapiquí, ca. 100 m, 10°26'N, 84°1'W, 20 Mar. 1981, *J. Folsom* 9404 (holotype, MO; isotype, F).

Guarea gentryi a speciebus aliis *Guareae* in laminis foliolorum oblongis vel ellipticis 11–19 × 4–7 cm in siccitate brunneis, inflorescentiis ramulis 8 usque ad 15 instructis, floribus numerosis parvis in alabastris apicibus late obtusis, in anthesis petalis subtriangularibus 3–4 × 2–3 mm et tubis staminalibus 2–3 × 3–4 mm, differt.

Tree 15–35 m tall, to ca. 1 m diam.; young branches sparsely pubescent to glabrescent. *Leaves* with 2 to 4 pairs of leaflets, rachis terete, minutely pubescent to glabrescent; *petiolule* terete, strigose,

bottle-shaped, 6–13 × 1–2 mm; *blade* subcoriaceous, oblong to elliptic, 11–19 × 4–7 cm, apex short-acuminate, acumen ca. 1 cm, base acute or cuneate, both surfaces drying brown, adaxial surface glabrous, abaxial surface with short trichomes sparsely scattered on the surface, with trichome tufts in the axils of secondary veins, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins strongly raised adaxially and slightly raised abaxially, slightly curved toward the margin, 6 to 9 pairs, 1.3–3 cm apart, tertiary veins slightly raised, reticulate. *Inflorescence* axillary, paniculate, 12–17 cm, sparsely pubescent, yellowish green, branches 3–7 cm, 8 to 15 per inflorescence, with numerous flowers; bracts ca. 1 mm, strigose; *pedicel* ca. 1 × 1 mm, with yellowish indumentum. *Flowers* greenish white, densely yellowish pubescent, apex of bud broadly obtuse; ovary glabrous, surface irregular, 4- to 5-locular, locules 1-ovulate. *Staminate flower*: calyx ca. 1 mm, ± spreading, teeth ca. 0.5 mm; petals 3–4 × 2–3 mm, subtriangular, flowers yellowish toward the apex, otherwise densely brownish pubescent; staminal tube 2–3 × 3–4 mm, scarcely pubescent to glabrescent outside, glabrous inside, margin dentate; anthers ca. 0.5 × 0.5 mm; gynophore absent; nectary ca. 0.3 × 1.5 mm; ovary ca. 1 mm; style ca. 1 mm; stigma 0.5 × ca. 1 mm, rounded. *Carpellate flower*: unknown. *Fruit* globose, brown, ca. 2 mm diam., surface minutely rough, not stipitate; seeds 3 or 4; aril red.

Ecology, distribution, and phenology. Collected in rain forest, 40–500 m, from Costa Rica (Heredia, Limón) and Nicaragua (Atlántico Norte). Flowering and fruiting in March.

Local collectors have included specimens of this species in the *Guarea glabra* complex because of the trichome tufts in the vein axils. However, *G. gentryi* is quite different, having staminate flowers with indumentum yellowish toward the apex, and otherwise densely brownish pubescent; a small, spreading calyx ca. 1 mm long; and short, subtriangular petals (3–4 × 2–3 mm). Its elliptic-oblong leaflets have bottle-shaped petiolules (the petiolule is rather swollen basally but narrows before it joins the lamina) and dry to a brown color on both sides.

The only collection known from Nicaragua was made in 1971 on the north Atlantic Coast in an area that is not protected; therefore, it is possible that this species is danger of extinction in that country.

Paratypes. COSTA RICA. **Heredia:** Finca La Selva, OTS Field Station on the Río Puerto Viejo just E of jet. with Río Sarapiquí, *B. Hammel & J. Trainer 12844* (F, MO, NY), *G. S. Hartshorn 1408* (MO, OXF). **Limón:** Res. For. Cordillera Volcánica Central, ca. 4.5 km N of entrance to Braulio Carillo along San José–Guápiles hwy., *B. Hammel,*

M. M. Chavarría, G. Herrera & R. Robles 17058 (MO); Matina, P.N. Barbilla, Cuenca del Matina, Col. Puriscalena, Sendero Cerro Azul, *E. Mora 906* (MO). NICARAGUA. **Atlántico Norte:** Sur de Río Wawa, 60 km NE de Puerto Cabezas, *E. L. Little 25202* (MO).

4. *Guarea mexicana* Coronado, sp. nov. TYPE: Mexico. Chiapas: Bochil, along rd. from Bochil to Simojovel, 4.5 mi. NE of Bochil, 31 May 1965, *D. E. Breedlove 10220* (holotype, NY).

Guarea mexicana a speciebus aliis *Guareae* in laminis foliolorum longe oblongis vel ellipticis 10–23.5 × 4–6 cm textura coriacea et petalis 9–11 mm (in floribus staminatis) vel 7.5–8 mm (in floribus carpellatis) longis, differt.

Tree 8–18 m tall; young branches sparsely pubescent. *Leaves* with 2 to 3(to 4) pairs of leaflets, rachis canaliculate, yellowish pubescent; *petiolule* inflated, yellowish pubescent, 4–6 × 2–3 mm; *blade* coriaceous, long-oblong to elliptic, 10–23.5 × 4–6 cm, apex short-acuminate, acumen 0.5–0.9 cm, base oblique, margin recurved, adaxial surface drying brown and abaxial surface drying light brown or pale green, adaxial surface glabrous, abaxial surface with indumentum on main veins, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins slightly raised adaxially, strongly raised abaxially, abruptly curved toward the margin, 8 to 11 pairs, 1–2.5 cm apart, tertiary veins raised, randomly reticulate. *Inflorescence* axillary, paniculate, 2–7 cm, sparsely to densely brown pubescent, branches 1–2 cm, 0 to 2 per inflorescence; bracts ca. 1 mm, pubescent; *pedicel* 2.5–3 × 1–2 mm, brown pubescent. *Flowers* white, apex of bud rounded; calyx densely pubescent to glabrescent, lobes ± erect; petals 5, valvate, oblong, apex rounded; staminal tube glabrous, margin entire, sparsely to densely yellowish pubescent; ovary glabrous, 4- to 5-locular, locules 1-ovulate. *Staminate flower*: calyx ca. 4 mm, lobes ca. 3 mm; petals 9–11 × 3–4 mm; staminal tube 7–8 × 5–6 mm; anthers ca. 0.5 × 0.6 mm; gynophore ca. 2 × 2 mm; nectary absent; ovary ca. 3 mm; style ca. 4 mm; stigma ca. 1 × 1 mm. *Carpellate flower*: calyx ca. 6 mm, lobes ca. 3.5 mm; petals 7.5–8 × ca. 3 mm; staminal tube ca. 5 × 4 mm; anthers ca. 1 × 1 mm; gynophore ca. 2 × 2 mm; nectary absent; ovary ca. 2 mm; style 1–2 mm; stigma ca. 0.7 × 0.5 mm. *Fruit* brown or dark red, ca. 3 cm diam., rough with few small lenticels, glabrous, calyx persistent; seeds 4; aril unknown.

Ecology, distribution, and phenology. Collected from lower montane rain forests, 900–1350 m, from Mexico (Chiapas) and Honduras (Comayagua). Flowering in May, August, and December; fruiting in August and December.

Guarea mexicana was included in *G. glabra* by Pennington et al. (1981). However, he saw only two specimens of this species and mentioned that they were intermediate between *G. excelsa* Kunth and *G. bijuga* C. DC. *Guarea mexicana* differs in a number of morphological features from any other members of the *G. glabra* complex and can be recognized by its long, relatively narrow, coriaceous leaflets (10–23.5 cm long, ca. 3 times longer than broad) in which the upper surface dries brown and the lower surface dries light brown or pale green, its oblique base, and recurved margins. Its flowers have a large calyx with erect lobes at least 3 mm long, while its fruits are brown and lenticellate.

Paratypes. MEXICO. **Chiapas:** Berriozábal, 13 km N of Berriozábal near Pozo Turipache & Finca El Suspiro, *D. E. Breedlove* 20245 (F, MO), *D. E. Breedlove* 35320 (MO), *D. E. Breedlove* & *A. R. Smith* 21678 (MO), *D. E. Breedlove* & *R. D. Thorne* 30774 (MO); La Chacona, *C. Enríquez* 7581 (MEXU). HONDURAS. **Comayagua:** Trincheras, *L. O. Williams* & *A. Molina* R. 14655 (MO).

5. *Guarea zarceriensis* Coronado, sp. nov. TYPE.

Costa Rica. Alajuela, San Carlos, Zarcerro, 870 m, 1 Mar. 1939, *A. Smith* 1686 (holotype, NY; isotype, MO).

Guarea zarceriensis a speciebus aliis *Guareae* in laminis oblongis-ellipticis vel ovatis 9–20 × 4–8 cm apicibus abrupte acutis, petalis indumento flavido denso appresso praeditis, ovariis 4 usque ad 5-loculatis, et fructibus pericarpio duro pagina lamellata, differt.

Tree or shrub 3–20 m tall, 20–50 cm diam.; young branches glabrescent. *Leaves* with 3 to 4 pairs of leaflets, rachis canaliculate, minutely pubescent to glabrescent; *petiolule* canaliculate, strigose, 10–25 × 0.5–1.5 mm; *blade* membranaceous to subcoriaceous, oblong-elliptic to ovate, 9–20 × 4–8 cm, apex abruptly acute to rounded (acuminate to 2 cm), base cuneate, margin entire, drying pale greenish brown on abaxial surface and darker on adaxial surface, both surfaces glabrescent, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins impressed adaxially, raised abaxially, slightly curved toward the margin, 5 to 8 pairs, 1–2.3 cm apart, tertiary veins raised, randomly reticulate. *Inflorescence* axillary, paniculate, 4–14 cm, pubescent, branches ca. 2 cm, 0 to 2 per inflorescence; bracts ca. 1 mm, pubescent; *pedicel* 1.5–3 × 1.5–2 mm, pubescent. *Flowers* white, sparsely pubescent, apex of bud rounded (acute); calyx lobed, ± erect; petals densely yellowish pubescent, oblong, apex acute; staminal tube glabrous, margin entire (undulate); ovary densely yellow-pubescent; style densely pubescent to glabrescent, 4- to 5-locular, locules

1-ovulate. *Staminate flower:* calyx 3–5.5 mm, lobes ca. 2.5 mm; petals 7–8 × 3 mm; staminal tube 5–6 × 3–5 mm; anthers 1.5–2 × ca. 1 mm; gynophore ca. 1 × 2 mm; nectary ca. 0.5 × 1.5 mm; ovary ca. 1.5 mm; style 2–3 mm; stigma ca. 0.5 × 1 mm. *Carpellate flower:* calyx ca. 2.5 mm, lobes ca. 1 mm; petals ca. 6 × 2.5 mm; staminal tube ca. 4 × 3 mm; anthers ca. 1.5 × 0.5 mm; gynophore ca. 0.5 × 1 mm; nectary absent; ovary ca. 2 mm; style ca. 1.5 mm; stigma ca. 0.5 × 1.5 mm. *Fruit* subspherical, ca. 2.5 × 2 cm, apparently 2-celled, surface ribbed, without lenticels; aril unknown.

Ecology, distribution, and phenology. Rain and cloud forests, 875–1150 m. Costa Rica (Alajuela). Flowering in March, September, and October; fruiting in July and September.

Material of this species has been tentatively identified as *Guarea brevianthera* C. DC., *G. trichilioides* L. [= *G. guidonia* (L.) Sleumer], *G. erythrocarpa* C. DC., *G. rhopalocarpa* Radlkofer, or the *G. glabra* complex (Pennington, 1981), but examination of all species of *Guarea* shows that it is quite distinct. Although *G. erythrocarpa* is similar to *G. zarceriensis* in leaflet shape and texture, the latter has a long petiolule 1–2.5 cm long, while *G. erythrocarpa* has a petiolule only ca. 0.5 cm long. *Guarea rhopalocarpa* is the only other species from Central America with ridged or ribbed fruits, and these are much larger and more or less obovoid. *Guarea zarceriensis* is clearly different from South American species with ribbed fruits.

Paratypes. COSTA RICA. **Alajuela:** Alfaro Ruíz, 5 km SO Zarcerro, *A. Smith* 861 (F, MO), *A. Smith* 2806 (F), *A. Smith* 2899 (F), *A. M. Brenes* 6718 (F); San Carlos, region Zarcerro, *A. Smith* 447 (F), *A. Smith* 448 (MO); Upala, Dos Ríos, 5 km al S de Brasilia, Río Pizote, *G. Herrera* 1053 (K, MO).

Acknowledgments. I am grateful to Jon Ricketson for many useful comments and to the directors of the herbaria cited for their generosity in loaning specimens for examination. The thesis from which this paper was taken satisfied in part the requirements for a Masters of Science degree at the University of Missouri, St. Louis.

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